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RESEARCH NOTES

负载型钴钼双金属氮化物催化氨分解研究

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摘要 Co and Mo bimetallic nitrides supported on Mg（Al）O, MgO and γ-Al2O3 were prepared in temperatureprogrammed reactions with NH3. The surface morphology, chemical composition and catalytic activity for NH3 decomposition on the supported Co and Mo bimetallic nitrides were studied by X-ray diffractometer （XRD）, NH3 temperature-programmed desorption and mass spectrometer （NH3-TPD-MS）, temperature-programmed desorption and mass spectrometer （TPD-MS）, H2 temperature-programmed surface reaction （H2-TPSR） and activity test. The phases of Co3Mo3N and MoN could be formed on Mg（Al）O, MgO and Al2O3 during the nitridation, and they might be more uniformly dispersed on Mg（Al）O and MgO than on γ-Al2O3. Transition metallic nitrides are generally considered as potential catalysts for hydrogen-involving reactions due to the entrance of hydrogen atoms into subsurface and the lattice of metallic nitrides. The diffusion of nitrogen in the bulk and the structure transformation of Co and Mo nitride compounds occur during NH3-TPD, but the supported Co and Mo bimetallic nitrides are not easily reduced at H2 atmosphere. Co3Mo3N/Mg（Al）O catalyst exhibits the highest activity, while Co3Mo3N/Al2O3 exhibitts the lowest activity for NH3 decomposition. Furthermore, the catalytic activity of Co and Mo bimetallic nitrides is not only much higher than that of supported single metallic nitride, but also highly dependent upon the surface acidity and BET surface area of support.

关键词 负载型钴钼双金属氮化物 氨 分解反应 催化剂 表面形态

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Supported Cobalt Molybdenum Bimetallic Nitrides for Ammonia Decomposition

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Abstract Co and Mo bimetallic nitrides supported on Mg（Al）O, MgO and γ-Al2O3 were prepared in temperatureprogrammed reactions with NH3. The surface morphology, chemical composition and catalytic activity for NH3 decomposition on the supported Co and Mo bimetallic nitrides were studied by X-ray diffractometer （XRD）, NH3 temperature-programmed desorption and mass spectrometer （NH3-TPD-MS）, temperature-programmed desorption and mass spectrometer （TPD-MS）, H2 temperature-programmed surface reaction （H2-TPSR） and activity test. The phases of Co3Mo3N and MoN could be formed on Mg（Al）O, MgO and Al2O3 during the nitridation, and they might be more uniformly dispersed on Mg（Al）O and MgO than on γ-Al2O3. Transition metallic nitrides are generally considered as potential catalysts for hydrogen-involving reactions due to the entrance of hydrogen atoms into subsurface and the lattice of metallic nitrides. The diffusion of nitrogen in the bulk and the structure transformation of Co and Mo nitride compounds occur during NH3-TPD, but the supported Co and Mo bimetallic nitrides are not easily reduced at H2 atmosphere. Co3Mo3N/Mg（Al）O catalyst exhibits the highest activity, while Co3Mo3N/Al2O3 exhibitts the lowest activity for NH3 decomposition. Furthermore, the catalytic activity of Co and Mo bimetallic nitrides is not only much higher than that of supported single metallic nitride, but also highly dependent upon the surface acidity and BET surface area of support.

Key words Co and Mo bimetallic nitrides; surface morphology; support; ammonia decomposition

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